Meridian 1

Intelligent Peripheral Equipment Circuit Cards for China

Option 11 - Description and Installation

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Revision history

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This document has been updated to include information about Phase II features for China.

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About this document

This document is a Supplement to the Option 11 *Installation guide* 553-3011-210. It describes the functions and applications of the following circuit cards that are available for use in China:

- NTRA02AA Universal Trunk card with Music on hold (MOH), and Recorded announcement (RAN)
- NTRA03AA E&M Tie Trunk card
- NTRA04AA Flexible Analog Line card with high voltage message waiting
- NTRA05AA Flexible Analog Line card
- NTRA06AA Off premise station analog line card

The above cards were introduced as part of the X11 release 20 software program.

Universal trunk circuit cards

Functional description

The NTRA02AA Universal trunk card provides the interface between the Option 11 system and up to eight analog central office (CO) trunks. They can be installed in slot 1 to 10 in the main cabinet, as well as any slot in the expansion cabinet.

Common features

The NTRA02AA Universal trunk card provides;

- Analog to digital and digital to analog conversion for 8 audio paths, variable loss (in accordance with China IPE loss/level plan).
- Interface each of the 8 PCM digital signals to one DS30X timeslot in A10 format.
- Transmit and receive SSD signaling messages over a DS30X signaling channel in A10 format.
- T1/R1 conductors with 200Ω+0.1uf / 680Ω for 2 wire voice path with a balanced terminated impedance via T1 hybrid transformer.
- Indication of board status with faceplate mounted LED.
- For disabling of individual channels or entire board under software or IPEC control.
- Outpulsing on-board, the make break ratios will be software downloadable in the initial configuration stage.
- Loopback of PCM signals to DS30X for factory test and diagnostic purposes.

- Self-test pass indication with faceplate LED.
- Card self ID for auto configuration.
- Allow Trunk type to be configured via Service change (S/W Overlay) on a per-channel basis.
- Impedance of 200Ω+680Ω//0.1uf.
- Balance impedance of 200Ω+680Ω//0.1uf.
- Software selectable A/U Law operation.
- -10 to +3dB dynamic attenuation pads on a per call basis.
- Detection and reporting battery reversal to S/W for battery supervision.
- Music on hold operation
- Recorded announcement trunk operation
- Paging trunk operation.

Physical description

Switch settings

There are no option switches on the NTRA02AA Universal trunk card. All settings are configured in software.

Connections

The NTRA02AA Universal trunk card has eight units. Each unit connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal.

At the cross-connect terminal, each unit connects to external apparatus by Tip and Ring leads.

Trunk configuration

Route Data Block

Each trunk unit on the NTRA02 Universal trunk card is attached to a route with an associated route data block.

The route data block is programmed in overlay 16, as described in Table 1

Table 1
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	
TYPE	RDB	Define a new Route Data Block
CUST	0-99	Enter customer number
ROUT	0-127	Enter route number
TKTP	COT	Define trunk type as central office
ICOG	IAO	Incoming and Outgoing trunk
CNTL	YES	Change a trunk timer
TIMER	ICF 512 NRD 29952 RGV 256 GTO 1024	Flash Timer is fixed Set No Ringing Detector Change Timer to 29952 Set Ring Validation Timer to 128 ms Set Guard Timer Outgoing to 1024 ms
CDR	YES	Call Detail Recording allowed

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NTRA02 Universal trunk card. Default values are shown in brackets.

Table 2
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW	Define a new unit
TYPE	COT	Central Office Trunk
TN	LSCU	Loop Shelf Card Unit
XTRK†	EXUT	Type is IPE EXUT
		† Only required for the first unit to be defined for that pack.
CDEN	(8D)	Card Density is 8D (default)
SIGL	LOP	Loop Start Signaling
CLS	DTN, (DIP)	Digitone (Digipulse) Signaling

Self-test

When the NTRA02 trunk card is installed and power is applied to it, a self-test is performed on the card. The red LED on the faceplate flashes three times, then remains continuously lit until the card is enabled in software. If the self-test fails, the LED will remain lit.

Technical description

Power requirements

Table 3 shows the power requirements for the NTRA02 Universal trunk card.

Table 3
NTRA02 circuit card power requirements

V volts	I (ma) idle	I (ma) seize	I (ma) all units outpulsing
+ 15 V Note 1	170	252	330
- 15 V Note 1	170	249	249
+ 8.5 V Note 2	101	100	100
+ 5 V	160	322	322

Note 1: Analog circuitry is powered with ± 12V generated from ± 15V. The maximum current imbalance between the ± 15V rails is 100 ma per circuit pack.

Note 2: 8.5V is regulated to give 5V.

Environmental specifications

Table 4 lists the environmental specifications of the NTRA02 Universal trunk card.

Table 4
NTRA02 circuit card environmental specifications

Parameter	Specifications
Operating temperature	10 to 45 degrees C, ambient
Operating humidity	20 to 80% Relative Humidity
Storage temperature	- 20 to + 60 degrees C
Storage humidity	5 to 95% Relative Humidity

Transmission parameters

Table 5 lists Loss values for the NTRA02 Universal trunk card.

Table 5
NTRA02 circuit card Loss values

	Base (Pad out)	Alternate (Pad in)
A/D (receive)	- 1.5 dB	0 dB
D/A (transmit)	+ 2.0 dB	+ 3.5 dB

Note: Negative dB values denote gain.

Trunk types description

The NTRA02 Universal Trunk card supports loop start signaling.

Loop start operation

Loop start operation is configured in software and is implemented in the card through software download messages.

Idle state

In the idle state, the ringing detector is connected across the tip and ring leads. The Universal trunk card provides a high impedance loop toward the public exchange for isolation and dc detection.

Call placed by public exchange

The Central Office indicates an incoming call by reversing battery. Within 2 seconds of battery reversal, ringing voltage is applied between the tip and ring leads. If the call is answered, the ringing detector on the trunk card is switched out and a low resistance DC loop is placed between the tip and ring leads.

Call placed by Option 11

To initiate a call, the Option 11 switches out the ringing detector and places a low resistance loop across the tip and ring leads. The Option 11 sends digits in the form of Dual Tone Multifrequency (DTMF) tones or loop disconnect pulses.

Call disconnect

The Option 11 controls the release of telephone calls. To indicate call disconnect, the Option 11 removes the dc loop across the tip and ring wires for longer than 800 ms. The ringing detector is then switched in and a high impedance loop is presented to the public exchange.

Phase II Features for China

Toll Call Loss Plan

The Toll Call Loss Plan feature provides the requirement of 7 dB loss for 2.0 Mbps Digital Trunk Interface (DTI2) toll calls from a Meridian 1, acting as a Class 5 (C5) office. It is only applicable for a DTI2 trunk connection to a PBX (500/2500) set.

The outgoing toll call is recognized by defining the toll digits as a Special Service List number in LD 18 and specifying it in the DTI2 Route Data Block. For incoming calls, the toll status is provided by the Multifrequency Compelled (MFC) signaling. When the toll status is determined, the appropriate pad values are used on the DTI2 card and 500/2500 line card.

Busy Tone Detection

In many countries, loop start trunks are not supervised. Therefore, the Public Exchanges/Central Offices are required to send a busy tone to the remaining party of a connection when the other party has disconnected. A tone detector must be used to detect this tone.

In X11 Release 21, the Phase II — Busy Tone Detection (BTD) feature allows a technician to enter the characteristics of the busy tone to be detected in LD 97. This information is downloaded to the Public Exchange trunk card for use during call processing. Once the busy tone is detected, the trunk sends a message to the Meridian 1 software, which then disconnects the call, and the trunk is free for other uses.

An option is provided to allow Busy Tone Disconnect to occur only for incoming calls. This option is also programmed in LD 97. Cadence information is downloaded on a card basis.

E&M Tie trunk circuit card

Functional description

The NTRA03AA E&M Tie trunk card provides the interface between the Option 11 system and up to four analog trunks. It can be installed in slots 1 to 10 in the main cabinet and in any slot in the expansion cabinet.

The NTRA03AA E&M Tie trunk card supports four analog trunks. Each trunk circuit can be individually configured as:

- 2 wire type I and type II signaling
- 4 wire E/M type I and type II signaling
- 4 wire DX (duplex signaling)
- Paging trunk (PAG)

Common features

The following features are common to all units on the NTRA03AA E&M Tie trunk card:

- convert transmission signals from analog-to-digital and digital-to-analog
- provide outpulsing on the card: make/break ratios are defined in software
- and downloaded at power-up and by software command
- provide 600-ohm balance impedance (2-wire configuration)
- provide pad control for 2-wire and 4-wire facility connections

- allow trunk type and function to be configured on a per port basis in software
- provide isolation of foreign potentials from transmission and signaling circuit
- provide software control of A-Law and μ-Law modes
- support loopback of pulse code modulation (PCM) signals to DS-30X for diagnostic purposes

The following features will be included in the NTRA03AA. These features are not supported by existing trunks. The NTRA03AA will operate only with IPE shelves and software.

- 2-wire, E&M Type I signaling with:
  - near-end seizure and outpulsing with M lead
  - ground detection with E lead
  - voice transmission through tip and ring for transmit and receive
- 4-wire, E&M Type I and II signaling, 2-way dial repeating with:
  - echo suppression for Type I
  - switchable 7 dB and 16 dB pads for carrier interface
  - voice transmission and reception through two separate paths
  - Type I signaling through E&M leads
  - Type II signaling with near-end seizure by SB/M leads and far-end detection by E/SG leads
- 4-wire, DX signaling
- paging trunk operation with:
  - support access by low resistance path at the PG/A1 leads
  - paging end-to-end signaling is not supported

Physical description

Switch settings

There are no option switches on the NTRA03 E&M Tie trunk card. All settings are configured in software.

Connections

The NTRA03 trunk card has four units. Each unit connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. Refer to the *X11 Planning and Engineering Guide 553-3011-100* for more detailed information about the E&M trunk card

Self-test

When the NTRA03 trunk card is installed and power is applied to it, a self-test is performed on the card. The red faceplate LED on flashes three times, then remains continuously lit until the card is enabled in software. If the self-test fails, the LED will remain lit after the card is enabled.

Technical description

Power requirements

Table 6 lists the power requirements for the NTRA03 trunk card.

Table 6
NTRA03 Power requirements

Voltage	Tolerance	Idle current	Active current
±15.0 V dc	± 5%	200 mA	200 mA
+ 8.5 V dc	± 2%	200 mA	200 mA
- 48 V dc	± 5%	415 mA	415 mA
+ 5 V dc	N/A	N/A	N/A

Environmental specifications

Table 7 lists the environmental specifications of the NTRA03 E&M trunk card.

Table 7
NTRA03 circuit card environmental specifications

Parameter	Absolute Limit
Operating temperature	0 to + 60 degrees C (32 to + 140 degrees F), ambient
Operating humidity	5 to 95% Relative Humidity
Storage temperature	- 40 to + 70 degrees C (- 40 to +158 degrees F)

Transmission parameters

NTRA03 provide the capability of switching pad values in both A/D and D/A directions. These pads will be external to the B34 codec. In addition the B34 codec can provide a wide range of level adjustment for transmission. The trunk will be configured as 2-Wire or 4-Wire at initialization. The MPU will use this fact to decide which value to switch (Base or Alternate).

Loss values for the NTRA03 E&M Tie trunk card are as follows:

Table 8
Loss values for the NTRA03 E&M card

	Base (Pad Out)		Alternate (Pad In)	
	2-Wire	4-Wire	2-Wire	4-Wire
A/D (receive)	- 2.5 dB	-3.0 dB	0 dB	0 dB
D/A (Transmit)	+1.0 dB	+0.5 dB	+3.5 dB	+3.5 dB

Note: Negative dB values denote gain.

Trunk types description

The NTRA03 can be divided into two groups:

- Individual trunk circuit
- Signaling and control portion

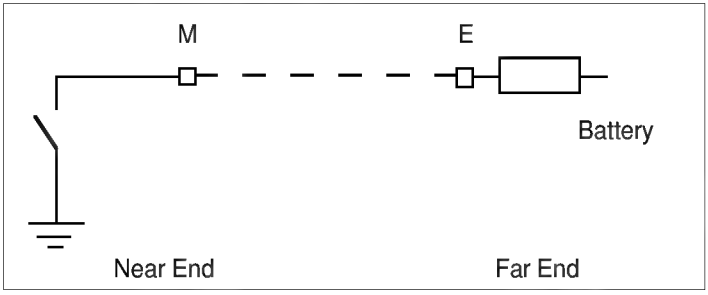
The NTRA03 contains 4 individual Trunk circuits. Each individual Trunk circuit, in support of the previously described features, will provide the following functions:

- E & M signaling, type I and II, 2 way repeat trunk (including Echo suppression).
- 4 Wires DX signaling with loop range compensation is provided by manual switch.
- Ground detection of the E lead in E & M type I
- Detection of bridge unbalance when in DX signaling mode.
- Near end seizure and outpulsing with M lead in E & M mode type I.
- Far end detection with EA/EB leads in type II.
- Near end seizure with MA/MB leads in type II.
- Switchable 7 dB and 16 dB pads for carrier interface.
- Paging access via a low resistance path at the PA/PB leads. (Note that All-call Zone paging will not be implemented directly by NTRA03AA hardware)
- Out-of-service / busy without ground detection via OSO lead for Dictation.

4-wire E&M Type I trunk operation

Type I E&M operation uses two signaling leads, E and M, that are electrically separated from the associated speech circuit. Signals are sent on the M lead and received on the E lead as shown in Figure 1.

Figure 1
E&M Type I signaling



Idle state

For E&M signaling, in the idle state the M lead is ground and the E lead is an open circuit.

Outgoing calls

Outgoing calls are processed as follows:

- The M lead changes from ground to battery.
  - — If answer supervision is provided by the far end, there is a change from open to ground on the E lead (ground detection).

Incoming calls

The far-end initiates calls as follows:

- Ground is placed on the E lead in E&M signaling.
- Dial pulses are subsequently applied from the far end as ground open on the E-lead.
- If the far end is equipped for sending, the system may be operated in any mode (immediate start, delay dial, or wink start), as assigned on a start arrangement basis.
  - — In immediate start mode, there is no start signal from the called office. The seizure signal (off-hook supervisory state) from the far end should be at least 150 ms. At the end of the seizure signal, the far end may start pulsing after the standard delay (normally 70 ms minimum).

— In delay dial mode, a 256-384 ms off-hook/on-hook signal is returned to the far end immediately after receipt of the seizure signal. When the far end detects the on-hook state of the signal (start signal), the far end may start pulsing after the standard delay (normally 70 ms minimum).

— In wink start mode, within a 128-256 ms period after receipt of the seizure signal from the far end, the called office transmits a 250 ms, wink start, off-hook/on-hook signal to the calling office.

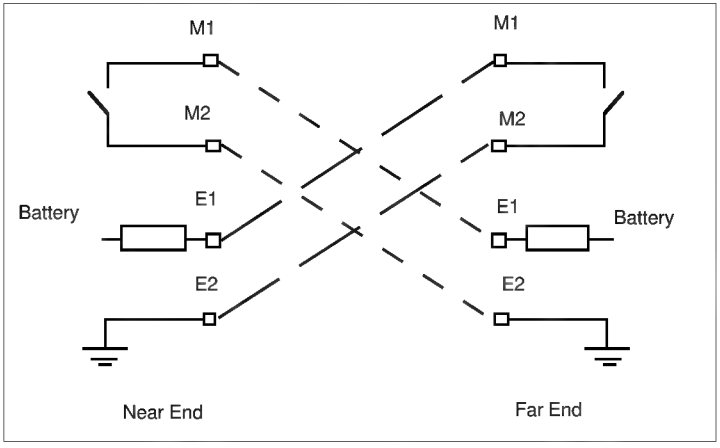
4-wire E&M Type II trunk operation

Type II signaling uses four leads: M, SB, E, and SG. Instead of changes of state between battery and ground (M signals) or open and ground (E signals), the trunk signals by closing the contacts between the lead pairs M and SB. Signals are received by detecting current flow between lead pairs E and SG.

On incoming calls, the far end seizes the trunk by shorting the E and SG leads together. This transmits the ground from the SG lead to the E lead (in Type I signaling the ground to the E lead comes from the far end). Dialing is done by opening and closing the E/SG contacts. Since the SB and M leads are also used as the ESCG and ESC leads, respectively, for echo suppression, echo suppressor control cannot be used with Type II signaling.

Note: M, SB, E, and SG designations are Electronic Industries Association and Telecommunications Industries Association (EIA/TIA) conventions. These leads are also known as MB, MA, EA, and EB, respectively, in Meridian 1 conventions.

Figure 2
E&M Type II signaling



Release control

Release control of a call made over a trunk is specified in LD16. The two options available are either or originating party control. These may be specified for the Option 11 end (near end), or for the CO or other PBX end (far end). Joint party control may also be specified for the far end.

Paging trunk operation

When used in the paging mode, the trunk circuit is connected to a customer-provided paging amplifier system (not zone selectable). When accessed, the card provides a loop closure accross control leads PG and A1. In a typical application, the loop closure will cut off a music supply and switch the paging trunk transmission path to the paging amplifier.

Phase II Features for China

Toll Call Loss Plan

The Toll Call Loss Plan feature provides the requirement of 7 dB loss for 2.0 Mbps Digital Trunk Interface (DTI2) toll calls from a Meridian 1, acting as a Class 5 (C5) office. It is only applicable for a DTI2 trunk connection to a PBX (500/2500) set.

The outgoing toll call is recognized by defining the toll digits as a Special Service List number in LD 18 and specifying it in the DTI2 Route Data Block. For incoming calls, the toll status is provided by the Multifrequency Compelled (MFC) signaling. When the toll status is determined, the appropriate pad values are used on the DTI2 card and 500/2500 line card.

Flexible analog line circuit card

Functional description

The NTRA04AA Flexible analog line card with high voltage message waiting provides an interface for up to 16 analog (500/2500-type) telephones lines. It can be installed in slots 1 to 10 in the main cabinet and in any slot in the expansion cabinet.

The NTRA05AA Flexible analog line card is the same as the NTRA04AA Flexible line card but it does not support message waiting.

Common features

The NTRA04AA Flexible Analog line card provides the following features:

- Provide analog to digital and digital to analog conversion for 16 audio phone lines.
- Interface each of the 16 digital (PCM) signals to one DS30X timeslot in A10 format.
- Transmit and receive SSD signaling messages over a DS30X signaling channel in A10 format.
- Provide current drive with a balanced three component complex termination.
- Provide ON HOOK/OFF HOOK detection.
- Provide for connection of an AC ringing signal and automatic disconnection when the station set goes offhook.
- Synchronize connection and disconnection of ringing signal near zero crossing of ringing current.

- Provision for loopback of SSD messages for diagnostic purposes.
- Provide indication of board status with faceplate mounted LED.
- Provide correct initialization of all features at power up.
- Provide a 1 Hz warning signal for message waiting indication (high voltage message waiting).
- Provide line current to telset which is to be limited on short loops, and under fault conditions. Otherwise the loop current will vary with loop length to allow automatic gain compensation to operate in the telset.
- Software selectable A-law or Mu-law coding
- Loss plan is software downloadable
- Provide loopback of PCM signals for diagnostic purposes.
- Provide card self ID for auto configuration.
- Provide direct reporting of digits dialed (500 sets) by collecting dial pulses (10 and 20 pps).
- Provide 1100 Ω loop length with 18mA loop current.
- Support up to 5 C4A ringers in parallel.

Physical description

Switch settings

There are no option switches on the Flexible Analog line card. All settings are configured in software.

Connections

The Flexible Analog line card has 16 units. Each unit connects to the shelf backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel which is then cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Faceplate LED

The faceplate of the NTRA04AA is equipped with a red LED which lights when all of the assigned units on the circuit card are disabled.

Technical description

Power requirements

Table 9 lists the power requirements for the NTRA04 Flexible Analog line card.

Table 9
NTRA04 Flexible Analog line card power requirements

Voltage	Tolerance ±	Idle ma	Current ma Active	Max ma
+ 15.0 vdc	0.05 vdc	120	0	120
- 15.0 vdc	0.05 vdc	24	0	24
+ 8.5 vdc	1.00 vdc	250	8	280
- 48.0 vdc	2.40 vdc	0	10 Note 1	320
- 48.0 vdc	2.40 vdc	60	40 Note 2	700
Ring vac	5.00 vac	0	10 Note 3	160 Note 3

Note 1: Each active ringing and message waiting relay requires 10 ma of battery.

Note 2: The active current is the increment for each active line. Loop current varies from 20 to 45 ma depending on loop length.

Note 3: Reflects the current for ringing a single station set. There may be more ringers on each line.

Note 4: The +5VDC and+12V DC are on-board supplies. The + 5 volts is regulated from the +8.5 volt supply and the + 12 volt is regulated from the +15 volt supply.

Environmental specifications

Table 10 lists the environmental specifications of the Flexible Analog line card.

Table 10
NTRA04 Flexible Analog line card environmental specifications

Parameter	Specifications
Operating temperature	0 to +70 degrees C, ambient
Storage temperature	- 40 to + 70 degrees C
Operating humidity	10 to 95% Relative Humidity
Storage humidity	0 to 95% Relative Humidity

Signalling

Loop operation

The Flexible Analog Line Card is loop start, with a loop limit of 400 Ω at -48 V excluding the telephone set. The minimum and maximum values of current feed are 18 to 40 ma respectively. A resistance of more than 10 kohm is recognized as an idle or release signal.

Table 11 lists the number of telephone sets that can be supported by the loop.

Table 11
Loop limits

Loop resistance including telephone sets	Number of telephone sets
350 Ω or less	2
Over 350 Ω to a maximum of 1100 Ω	1

Ringers

Ringing is supplied to the telephones at a frequency of 13 to 55 Hz.

The Flexible Analog Line Card supports any number of ringers up to a maximum ac impedance presented to the line of 350 ohms. Table 12 shows the number of ringers supported for various loop lengths.

Table 12
Ringers supported on each unit of the NTRA04AA card

Number of Ringers	1	2	3	4	5
Loop Length (Ω)	1000	1000	850	600	350

Message waiting indicator

The message waiting indicator consists of a lamp flashing at a rate of 1 Hz at the telephone set. The lamp is activated by the application of high voltage (-150V) to the ring lead.

Digipulse dialing

The NTRA04AA Analog line card recognizes loop disconnect signals with the following limits:

- Pulse/pps8 - 14
- Pulse make/break ratio (1.3 - 2.5): 1
- Time Interval between pulse series > 350ms

Digitone dialing

Dual Tone Multifrequency (DTMF) tones are routed to the NT5K48 tone detector card.

Transmission parameters

The nominal impedance shall be 200 Ω in series with a parallel combination of 560 Ω + 100 nf. Loss values for the NTRA04AA Flexible Analog Line card are as follows:

Table 13
Non-switchable Loss values for the NTRA04AA card

A/D (receive)	0 dB
D/A (transmit)	+ 3.5 dB

Note: Negative dB values denote gain.

Phase II Features for China

Supervised Analog Lines

The Supervised Analog Lines feature provides two types of call supervision signaling capabilities: battery reversal; and hook flash disconnect supervision. These forms of supervision are provided to terminal devices connected to analog ports in the Meridian 1 system. This feature applies to Intelligent Peripheral Equipment only.

Battery Reversal Supervision

Battery reversal answer and disconnect supervision signaling is used for calls originating from the terminal device. It provides both far-end answer supervision and far-end disconnect supervision signals.

In the idle state, the analog port in the Meridian 1 provides ground signal on the tip lead and battery on the ring lead. This polarity is maintained during dialing and ringing at the far end. When the far end answers, the battery and ground connections are reversed. The reverse battery is maintained while the call is established. When the far end disconnects, the battery and ground connections are reverted to the idle state to signal that the far end has disconnected. If the terminal device disconnects first, the Meridian 1 sends the Deactivate Battery Reversal Scan Signal Distribution (SSD) message to the firmware after receiving the on-hook status to revert the polarity to its idle state.

Hook Flash Disconnect Supervision

Hook Flash Disconnect Supervision is used for incoming calls terminating at the terminal device. The signaling method provides only disconnect supervision since answer supervision on incoming calls does not apply. The disconnect signal is indicated by the removal of the ground connection to the tip lead for a specific period of time, which is provided by firmware ranging from a minimum of 10 milliseconds to a maximum of 2.55 seconds. The analog port is held busy for incoming calls while hook flash is in progress.

Off-premise station analog line card

Functional description.

The XOPSC functions can be divided into two groups:

- Individual Line Circuit
- Signaling and Control Circuit

Individual Line Circuit

The XOPSC board contains 8 individual line circuits. Each circuit consists of 1/4 of a quad filter/Codec (B34), a ringing relay, a battery reversal relay or a flashhook relay and associated circuitry. Each individual line circuit performs the following functions:

- Provide analog to digital PCM in DS30X format and digital to analog conversion of 8 analog phone lines.
- Interface the digital transmit and receive signals to one channel of a DS30X loop (A10 format)
- Interface the analog transmit and receive signals to the Tip and Ring with a balanced China termination.
- Provide complex balance impedance and input impedance to meet China requirements.
- Provide software programmable A/D & D/A gain via B34 flexible Codec.
- Provide ON-HOOK/OFF-HOOK signal and dial pulse detection based on loop current

- Provide the answer supervision and disconnect supervision line reversals to the key system per SL1 software message (the firmware update may be required when the software support is ready).
- Provide the flashhook signal (open Tip) as the disconnect supervision or the transferring signal to the Key system or the Centrex per SL1 software message (the firmware update may be required when the software support is ready).
- Provide relay for connection of 86 Vrms AC 20 Hz to activate ringer(s) in station set.
- Synchronize connection and disconnection of ringing signal to zero crossing of ringing current.
- Provide for loopback of PCM to the DS30X on a per channel basis for factory diagnostic.

Signalling and Control

The pack receives messages from the IPEC over a signaling channel in the DS30X loop, and returns status information over the same link. This process is used for call setup, teardown, and maintenance processes.

The signaling and control for the XOPSC consists of three major blocks; a microcontroller, a signaling interface chip, and a parallel I/O network.

The microcontroller will be an Intel 83C51FA or equivalent. It contains 8K of program memory and 256 bytes of RAM. It will have a crystal clock and operate asynchronously to the system clock. The processor will use interrupts to synchronize to the system events and will essentially provide an intelligent interface between the analog line interface and the MSL1 system core.

A signaling interface chip (A07) will be used to provide the layer 1 (DS30X interface) and layer 2 (flow control) of a 8 Kbit/sec signaling channel to the M-1 processor. The 83C51FA will provide the message encoding/decoding and execution, and signaling loopback. The A07 will support one DS30X signaling channel (#0).

The basic functions by the signaling and control block are listed below:

- Provide communications between the MSL1 processor and the line card.
- Monitor signals from line interfaces and generate a message for each state change.
- Decode received messages and activate/deactivate line interface relays.
- Monitor hookswitch line of each analog interface to detect dial pulses, hook flash, and on/off hook status.
- Provide 19.2kbps serial interface to card LAN.
- Receive download configuration data for card including the loss plan on a per-unit and per card basis.
- Perform self test diagnostics after power up, hardware reset, or when requested by software.
- Provide loopback of signaling messages for continuity test.
- Disable/enable selected channels for maintenance purposes.
- Drive front panel LED according to reflect board status.
- Accepts parameter downloads of existing timers (dialpulse time, offhook validate time, hookflash time, disconnect time, interdigit time), as is done for XFALCC.

Physical description

The OPS analog line card mounts in any IPE slot. The line interface and common multiplexing circuitry is mounted on a 31.75 by 25.40 cm (12.5 by 10 in.) printed circuit board.

The OPS analog line card connects to the IPE backplane through a 160-pin connector shroud. The backplane is cabled to the input/output (I/O) panel on the rear of the module, which is cabled to the main distribution frame (MDF) by 25-pair cables. Telephone lines from station equipment cross connect to the OPS analog line card at the MDF using a wiring plan similar to that which is used for trunk cards. See System installation procedures (553-3011-210) for termination and cross-connect information.

Self Test

The faceplate of the card is equipped with a red, light-emitting diode (LED). When an OPS analog line card is installed, the LED remains lit for two to five seconds while the self-test runs. If the self-test completes successfully, the LED flashes (off/on) three times and remains lit until the card is configured and enabled in software, then the LED goes out.

Technical description

Power requirements

The XOPSC circuit pack power budget follows the same engineering rules as the EXUT, which limits 10 cards per IPE shelf.

Table 14 lists the power requirements for the NTRA06 Off premise station analog line card.

Table 14
NTRA06 Off premise station analog line card power requirements

Voltage	Tolerance	Idle	Active
± 15 vdc	± 5%	306 ma	306 ma
+ 8.5 vdc	± 2%	450 ma	450 ma
- 48 vdc	± 5%	0 ma	415 ma

Environmental specifications

Table 15 lists the environmental specifications of the NTRA06 Off premise station analog line card.

Table 15
NTRA06 Off premise station analog line card. environmental specifications

Parameter	Specifications
Operating temperature	0 to +65 degrees C
Storage temperature	- 50 to + 70 degrees C
Operating humidity	5 to 95% RH from 0 to 65 °C
Storage humidity	5 to 95% RH from -50 to 70 °C
Temperature shock	- 50 to 25 °C or 70 to 25 °C in 3 min.
Temperature cycle	0 to 65 °C, delta = 3 °/min. 3 cycles

Signalling

Loop operation

XOPSC will support signaling range of 2300 Ohms including set at minimum 16mA at nominal or (FCC Part 68 Class B). Note that although 2300 Ohms far exceeds the OPX loop loss range (4.5 dB max.), it allows the use of transmission amplification equipment that does not have to extend the signaling range.

Operates over ONS range (0-2 dB) and OPS range (0-4.5 dB) (ref. Bellcore Telecommunications Transmission Engineering, Volume 3, Networks and Services).

Ringer Limitations

Supports up to 3 NE-C4A (or equivalent) type ringers bridge together per line on ONS applications and 1 NE-C4A ringer on OPS applications.

Table 16
NTRA06 Off premise station analog line card ringer limitations

Number of Ringers	3	1
Loop Limit (Ω)	300	2300

Digipulse dialing

Loop disconnect signals within the following limits shall be recognized:

- Pulse/pps8 - 14
- Pulse make/break ratio (1.3 - 2.5): 1
- Time Interval between pulse series > 350ms

Digitone dialing

Dual Tone Multifrequency (DTMF) tones are routed to the XTD pack which will detect DTMF tones in accordance with China specifications.

Transmission parameters

The nominal impedance shall be 200Ω in series with a parallel combination of 560Ω + 100 nF.

The B34 Codec shall provide switchable pad loss in both the transmit and the receive direction. These pads shall be independently switchable by the MSL1 software. The OPS card loss values (pad plus copper offset) are:

Table 17
Loss values for the NTRA06 OPS analog line card

	Base (Pad Out)	**Alternate** (Pad In)
A/D (receive)	- 2.5 dB	0 dB
D/A (transmit)	+1.0 dB	-3.5 dB

Note: Negative dB values denote gain.

Phase II Features for China

Supervised Analog Lines

The Supervised Analog Lines feature provides two types of call supervision signaling capabilities: battery reversal; and hook flash disconnect supervision. These forms of supervision are provided to terminal devices connected to analog ports in the Meridian 1 system. This feature applies to Intelligent Peripheral Equipment only.

Battery Reversal Supervision

Battery reversal answer and disconnect supervision signaling is used for calls originating from the terminal device. It provides both far-end answer supervision and far-end disconnect supervision signals.

In the idle state, the analog port in the Meridian 1 provides ground signal on the tip lead and battery on the ring lead. This polarity is maintained during dialing and ringing at the far end. When the far end answers, the battery and ground connections are reversed. The reverse battery is maintained while the call is established. When the far end disconnects, the battery and ground connections are reverted to the idle state to signal that the far end has disconnected. If the terminal device disconnects first, the Meridian 1 sends the Deactivate Battery Reversal Scan Signal Distribution (SSD) message to the firmware after receiving the on-hook status to revert the polarity to its idle state.

Hook Flash Disconnect Supervision

Hook Flash Disconnect Supervision is used for incoming calls terminating at the terminal device. The signaling method provides only disconnect supervision since answer supervision on incoming calls does not apply. The disconnect signal is indicated by the removal of the ground connection to the tip lead for a specific period of time, which is provided by firmware ranging from a minimum of 10 milliseconds to a maximum of 2.55 seconds. The analog port is held busy for incoming calls while hook flash is in progress.

Meridian 1

Intelligent Peripheral Equipment Circuit Cards for China

Option 11 - Description and Installation

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